

**CLAIMS**

What is claimed is:

1. A method for surface hardening a steel coil spring of a suspension system comprising the steps of:  
nitriding a surface of said coil spring; and  
regulating a nitriding potential in a nitriding atmosphere to control the step of nitriding said coil spring, said nitriding potential being the tendency of nitrogen to be absorbed by said steel coil spring.
2. The method as recited in claim 1 wherein the step of regulating said nitriding potential further includes monitoring at least one process parameter.
3. The method as recited in claim 1 wherein the step of nitriding said coil spring further includes introducing ammonia into said nitriding atmosphere.
4. The method as recited in claim 1 further comprising the steps of:  
cleaning said surface of said coil spring;  
heating said coil spring; and  
cooling said coil spring.
5. The method as recited in claim 4 wherein the step of heating said coil spring includes heating said nitriding atmosphere to a temperature between 380°C and 480°C.

6. The method as recited in claim 1 wherein the step of nitriding said coil spring produces a diffusion zone having a depth between 30  $\mu\text{m}$  and 100  $\mu\text{m}$ .
7. The method as recited in claim 1 wherein the step of nitriding said coil spring further includes forming a compound layer on said surface of said coil spring having a depth between 0 and 2  $\mu\text{m}$ .
8. The method as recited in claim 1 further comprising the step of shot peening said surface of said coil spring.
9. The method as recited in claim 9 wherein the surface of said coil spring is shot peened with a .8 mm diameter shot and a .3 mm diameter shot.

10. A method for surface hardening a steel coil spring of a suspension system comprising the steps of:
- cleaning said surface of said coil spring;
  - heating said coil spring;
  - nitriding a surface of said coil spring;
  - regulating a nitriding potential in a nitriding atmosphere to control the step of nitriding said coil spring, said nitriding potential being the tendency of nitrogen to be absorbed by said steel coil spring;
  - cooling said coil spring; and
  - shot peening said surface of said coil spring.

11. A steel coil spring of a suspension system comprising:  
a steel body portion having a surface; and  
a diffusion zone produced by nitriding said surface of said coil spring by regulation of a nitriding potential.
12. The coil spring as recited in claim 11 wherein said surface of said coil spring is nitrided by introducing ammonia into a nitriding atmosphere.
13. The coil spring as recited in claim 11 wherein a nitriding atmosphere is heated to a temperature between 380°C and 480°C.
14. The coil spring as recited in claim 11 wherein said diffusion zone has a depth between 30  $\mu\text{m}$  and 100  $\mu\text{m}$ .
15. The coil spring as recited in claim 11 wherein said coil spring further includes a compound layer having a depth between 0 and 2  $\mu\text{m}$ .